REMARKS

Claims 1-15, 17-37, and 66 are pending. Claims 4-5, 7, 12-13, 19, and 21 have been withdrawn from consideration. By this Amendment, claims 1, 27, 29, 33, 35, 36, 37, and 66 are amended. No new matter is added. Support for the claims can be found throughout the specification, including the original claims, and the drawings. Reconsideration in view of the above amendments and following remarks is respectfully requested.

The Office Action objected to Figures 1-6 indicating that they should be designated by a legend such as "Prior Art." The objection is respectfully traversed.

Applicant included these figures and the corresponding discussion in the detailed description of the invention as these figures are relevant to and assist in explaining the various methodology utilized in the novel and claimed method of removing one or more particle(s) adhered to a surface of a substrate or sample. As these figures and their corresponding disclosure are explanatory material included in the "Detailed Description of the Invention," Applicant has not amended Figures 1-6 to include the legend "Prior Art." Thus, it is respectfully submitted that this objection should be withdrawn.

The Office Action objected to the disclosure because of an informality. The Examiner's comment has been addressed in amending paragraph 116 of the present application. Accordingly, the objection is obviated and should be withdrawn.

The Office Action objected to the specification, as allegedly failing to provide proper antecedent basis for the claimed subject matter, referring to the recitation in claim 1 of "selecting laser energy transfer parameters and a composition, thickness, and geometry of an energy medium based on a composition of the one or more particles to be removed." The rejection is respectfully traversed.

The Examiner is directed to, for example, the Summary of the Invention, in which the present application recites in paragraph 16 at page 7, that "[t]he laser wavelength, the pulse length and shape of the laser energy, the laser energy density, the pulse repetition rate of the laser energy, the laser beam size and/or shape, the irradiation geometry, [all laser energy transfer parameters] the ambient conditions, the amount and disposition of the energy transfer medium, and/or the composition of the energy transfer medium are selected and controlled, based on the application (i.e., substrate and pattern, particle composition size, and shape) and environment (i.e., external ambient conditions, and pressure) considerations to precisely control the energy deposition into the particle/sample/energy transfer medium." Accordingly, support is provided in the specification for the claimed features and the objection should be withdrawn.

The Office Action rejected claims 1-3, 6, 8-11, 14-15, 17-18, 20, and 22-34 under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the enablement requirement, arguing that the specification does not provide any guidance or details as to

how to perform the step in claim 1 of selecting laser energy transfer parameters based on a composition of the one or more particles to be removed. The Examiner makes a similar allegation regarding claim 33. As set forth above, support is provided in the specification for the claimed features, and accordingly the rejection should be withdrawn.

The Office Action rejected claims 27-29 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Examiner's comments have been addressed in amending claims 27-29. Accordingly, the rejection should be withdrawn.

The Office Action rejected claims 1-3, 6, 8-11, 14-15, 18, 20, 22-26, 31, 35, 37, and 66 under 35 U.S.C. §102(b) as being anticipated by Tam. The rejection is respectfully traversed.

Independent claim 1 has been amended to recite selecting laser energy transfer parameters and a composition, thickness, and geometry of an energy transfer medium based on a predetermined removal threshold determined for a composition of the one or more particle(s) to be removed and a composition of the substrate and to recite that the energy transfer parameters and the composition, thickness, and geometry of the energy transfer medium are selected to control the energy deposition into at least the energy transfer medium based on the predetermined removal threshold designed to effect

removal of the one or more particle(s) from a surface while minimizing damage to the substrate, wherein the predetermined removal threshold is greater than forces adhering the one or more particle(s) to the surface and less than a damage threshold of the substrate. Nowhere does Tam discuss or suggest such features or such a threshold range. Independent claims 33, 35, 36, 37, and 66 have been similarly amended.

The inventor of the present application examined the various known methodology for removing particle(s) from the surface of a substrate or sample and determined based on experiment that laser energy transfer parameters and a composition, thickness, and geometry of an energy transfer medium (ETM) must be selected based on a predetermined removal threshold determined for a composition of the particle(s) to be removed and a composition of the substrate or sample to control energy deposition into the system in order to remove the particle(s) from the surface of the substrate or sample while minimizing damage to the substrate or sample. Applicant further determined that the predetermined removal threshold must be greater than forces adhering the particle(s) to the surface of the substrate and less than a damage threshold of the substrate or sample. Tam does not disclose or suggest such features. Rather, Tam merely discusses various techniques for removal of surface particles. Tam does not address threshold ranges.

Further, Tam acknowledges at page 3522 that "[q]uantitative understanding of the role played by the type and thickness of the liquid [ETM] used is yet to come" and that

"[q]uantitative theoretical understanding of the liquid-film enhanced laser-cleaning effect is lacking, e.g., peak temperature and pressures involved as well as particle ejection velocity and trajectory distribution." Tam further noted that "further work is needed to understand the optimization of the laser wavelengths and liquid type/thickness to be used under different cleaning conditions." Thus, Tam does not disclose or suggest the claimed features discussed above, and in particular the claimed threshold ranges.

In contrast, at page 13 of the present application, Applicant notes that removal thresholds for a wide range of particle sizes and compositions range from ~ 20-300 mJ/cm^2 for pulse lengths of ~7-30 ns, but that the addition of an energy transfer medium significantly lowers the removal thresholds in most cases. At page 15, Applicant notes that the thickness of the ETM should be selected with consideration of particle diameter, but it should not be so large that the laser pulse does not have enough energy to evaporate all of the ETM. Applicant further notes that the removal threshold is a function of substrate absorption (inherently tied to composition, thickness, and geometry of the ETM) with higher absorbing substrate having lower thresholds. Further, at page 17, Applicant notes that comparison of removal threshold is not always straightforward and the removal threshold depends on various parameters. Applicant then discusses the various parameters, i.e., energy fluence or intensity, spot size pulse length, and at pages 20-21 that removal thresholds are a function of the following parameters; the amount and

geometry of ETM and laser parameters, as well as environmental conditions. At page 19, Applicant states that removal thresholds are a function of laser parameters, optical properties of the substrate and particles, and optical and thermal properties of the ETM. By selecting laser energy transfer parameters and a composition, thickness, and geometry of the ETM based on a predetermined removal threshold determined for a composition of the particle(s) to be removed and a composition of the substrate energy deposition can be controlled to effect removal of the particles while minimizing damage to the substrate. Further, by selecting laser energy transfer parameters and a composition, thickness, and geometry of the ETM based on a predetermined removal threshold, which is greater than forces adhering the particle(s) to the surface of the substrate and less than a damage threshold of the substrate or sample damage to the substrate or sample may be avoided.

At pages 28-29, Applicant discusses an experimental application of the invention for a one micron diameter particle. In the example at pages 28-29, an unfocused laser beam intensity of 0.1 J/cm^2 with removal force of 650 dynes is selected for a one diameter particle on a silicon substrate based on a removal threshold which is significantly below the damage threshold for silicon of 55 J/cm^2. The invention relates the empirically determined force which binds a particle to the surface to the removal forces generated by explosive evaporation. The present application shows that a force (removal threshold) can be generated when the invention is properly applied which is orders of magnitude greater

than that which binds the particle to the surface, while still being orders of magnitude less than that capable of damaging the surface (damage threshold). The invention shows that the kinetic force which is brought to bear by the ETM as a result of absorbing energy and translating the absorbed energy to kinetic energy has been shown to be related to the laser energy transfer parameters as well as a composition, thickness, and geometry of the ETM.

Accordingly, the rejection of independent claims 1, 33, 35, 36, 37, and 67 over Tam should be withdrawn. Dependent claims 2-3, 6, 8-11, 14-15, 17-18, 20, 22-32 and 34 as well as withdrawn claims 4-5, 7, 12-13, 19, and 21, are allowable at least for the reasons discussed above with respect to independent claims 1 and 33, from which they respectfully depend, as well as for their added features.

In view of the foregoing amendments and remarks, it is respectfully submitted that the application is in condition for allowance. If the Examiner believes that any additional changes would place the application in better condition for allowance, the Examiner is invited to contact the undersigned attorney, **Carol L. Druzbick**, at the telephone number listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of

this, concurrent and future replies, including extension of time fees, to Deposit Account 16-0607 and please credit any excess fees to such deposit account.

Respectfully submitted,
FLESHNER & KIM, LLP

Carol L. Druzbick
Registration No. 40,287

P.O. Box 221200
Chantilly, Virginia 20153-1200
(703) 766-3701 CLD/kah:cre
Date: June 17, 2005
Please direct all correspondence to Customer Number 34610